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tion between the stomach and spleen is carried on; but the evidence is too strong to leave a doubt on the mind of the author as to their existence.

*Observations of a Comet, made with a View to investigate its Magnitude and the Nature of its Illumination. To which is added, an Account of a new Irregularity lately perceived in the apparent Figure of the Planet Saturn. By William Herschel, LL.D. F.R.S. Read April 7, 1808. [Phil. Trans. 1808, p. 145.]*

Dr. Herschel presuming that the motion of the comet would be correctly ascertained at the Royal Observatory at Greenwich, confined his observations to its physical condition, and relates the several circumstances which he remarked concerning its nucleus, its head, its coma, and its tail. The form of its nucleus was particularly attended to on the 4th of October, and remarked to be perfectly circular and equally bright on all sides.

Its magnitude was at the same time estimated at about  $3''$ , due care being taken to determine that the visible disc was not spurious, by means described in a former paper. It was examined with a 10-foot reflector, and with powers of 200 and 300; but its light was not found sufficient to bear higher powers.

On the 19th at  $5^h 40'$  it was again estimated at  $2\frac{3}{4}''$ , but at  $6^h 20'$  it was compared with Jupiter's third satellite, and found to be rather less than it.

The coma or nebulous appearance surrounding the head was at the same time estimated at about six minutes, and on the 6th of December at  $4^h 45'$ .

The tail on the 18th of October measured  $3\frac{3}{4}^\circ$ , but on the 6th of December it was reduced to  $23'$ . The tail was at various times observed to appear longer and more distinct on the south preceding, than on the north following, side.

Various authors having said that the tails of comets were so rare as not to affect the light of the smallest stars seen through them, Dr. Herschel paid particular attention to that circumstance; but uniformly found those stars which he saw emerge from behind the tail to become brighter than before in comparison to neighbouring stars.

On the 6th of December the head had the appearance of a large brilliant round nebula, suddenly much brighter in the centre. On the 1st and 14th of January it had still more the appearance of a nebula, with an increase of brightness in the middle; but even so late as the 21st of February, the nebulosity was observed to project a little on that side where the tail used to be seen.

The inferences which Dr. Herschel draws from these observations, are, first, that the body of the comet consists of solid matter about 538 miles in diameter; secondly, that since the portion of its visible hemisphere which could be illuminated by the sun on the 4th of October did not exceed  $120^\circ$ , and since it did not appear gibbous but perfectly circular, the surface of the comet must itself be luminous,

and the same inference is drawn respecting the nature of the tail; for if it were sufficiently dense to be visible by reflected light alone, at the distance of 235 millions of miles, its opacity would entirely prevent our seeing stars through it.

The length of the tail is computed to have been on the 18th of October upwards of nine millions of miles.

The resemblance of this comet to a nebula during the last ten weeks of its appearance excites a suspicion in Dr. Herschel's mind, that he may possibly have classed as nebulae other cometary bodies; but it would be a task of too many years' labour to revise his catalogue of nebulae for the chance of discovering any deficiency of those formerly observed.

In the second part of this paper, Dr. Herschel informs us, that he has remarked a new irregularity in the apparent form of Saturn; for that in the month of June last, there was a visible protuberance of its south pole, which could not have been overlooked at the time of his former observations. This he ascribes to the refraction of light in its passage through the atmosphere of the ring, which was interposed between us and the southern hemisphere, but, passing behind the northern hemisphere, did not occasion a similar protuberance.

*Hydraulic Investigations, subservient to an intended Croonian Lecture on the Motion of the Blood.* By Thomas Young, M.D. For. Sec. R.S. Read May 5, 1808. [*Phil. Trans.* 1808, p. 164.]

In the present inquiry, Dr. Young undertakes to investigate minutely and comprehensively the motion of fluids in pipes as affected by friction; the resistance occasioned by flexure, the laws of propagation of impulses through fluids contained in elastic tubes, the magnitudes of pulsations in conical vessels, and the effect of progressive contraction along a canal;—the physiological application of the results being reserved for a future opportunity.

In the first section the friction and discharge of fluids through pipes are considered; and the author assents to the encomiums bestowed on Mr. Dubuat, by Professor Robison, and other late authors on hydraulics, for his skill in adapting a formula to express the results of numerous experiments on this subject. But since the form of his expressions is not so convenient for practice as might be wished, and fails altogether in its application to extreme cases, Dr. Young has by approximation arrived at a formula, which appears to agree fully as well as Dubuat's with Dubuat's own experiments, which accords better with those of Gerstner, and extends also with equal accuracy to all extreme cases in which the former was erroneous.

In considering the velocities of water flowing through pipes, the friction appeared to consist of two parts, one of which is most apparent in small tubes, and varies as the velocity simply, and the other as the square of the velocity.

In order to show the agreement of Dr. Young's formulæ with the results of experiments, a table is formed containing forty experiments,